Debunking the Dutch Disease: An Empirical Analysis

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Abstract

The prior literature on the phenomenon of the Resource Curse includes the theory of the Dutch disease, in which the resource exporting sector crowds out other exports through an appreciation of the real exchange rate. This paper attempts to add to this literature by shedding some light on the existence of this mechanism, exploring the relationship between resource booms and the real exchange rate. Using a panel of countries over time, I look at the effect of real commodity price indices on countries' real effective exchange rates, sorting the countries by their resource export-intensiveness. The findings fail to support the hypothesis of the Dutch disease, as there is little evidence of a statistically significant relationship between a commodity price index change and a real exchange rate change. Nonetheless, the findings from this paper should be taken with extreme caution, as the regressions are single-factor and non-causal in nature. Further analysis would be prudent for those interested in deciphering the extent to which this relationship does or does not exist.

JEL Classification codes: Q33, F40, F31

Keywords : Dutch Disease, Resource Booms, Exchange Rates

I. Introduction

The Dutch disease refers to an appreciation of the real exchange rate resulting from increased exports and capital inflows within a country with a booming resource industry.[1] This elevated exchange rate feeds back into the rest of the economy and can crowd out other exporting sectors. This happened to the Netherlands after a Natural Gas boom in 1968, prompting *The Economist* to coin the term "Dutch Disease" in 1977.

The disease is but one factor within the supposed Resource Curse, the paradox that countries endowed with bountiful natural resources tend to grow at much slower rates than those without them.[2] There are multiple hypotheses behind this supposed curse, such as a lack of innovation in other sectors (would-be entrepreneurs go into the booming resource sector instead), volatile global commodity markets (which cause large swings of revenue flows, slowing growth), and weak governmental institutions (which can last without reform for longer periods of time due to booming sector revenues). That said, while not the topic of this paper, it is worth noting that the Dutch "disease" may not be a "disease" at all. It may play out as merely a new equilibrium of an economy given a new set of endowed resources, with a drag on growth only occurring with learning-by-doing or increasing returns to scale in the shrinking sector (which are foregone over time by having more labor and capital go into the booming resource sector instead).[3]

This apparent paradox is especially interesting today given the increasing global nature of the world economy, the rising global prices of many commodities, the various policies enacted to manipulate exchange rates, as well as the divergent paths of many

[1] The Dutch disease refers to increased exogenous capital inflows more generally (an influx of foreign aid could qualify, for example), but I will only focus on the resource aspect in this paper.
[2] See Sachs and Warner (1995) for a more comprehensive analysis.
[3] Krugman (1987).

resource-rich countries. Some countries are heavily reliant on resource exports, so these nations need to be especially mindful of the Dutch disease, should it exist, as deindustrialization of another exporting sector may set in.

The existence of the Dutch disease in the real world has been tested empirically, to a degree. The fluctuating nature of foreign exchange markets can make it difficult to parse out any short run trends, and international trade data has only been around for so long, limiting the amount of empirical analyses. Much of the focus of other papers has been on oil producing countries. There are plenty of reasons for this, such as the availability of data, and the reliance on oil of many OPEC nations exceeding that of other commodity exporters. This paper, however, will consider commodity exporting nations more broadly. For example, many metals are highly demanded at the moment, as businesses need them for new technological products. Furthermore, some countries, such as Chile, export a relatively high amount of copper and other metals, implying that the "disease" might just as well occur for them, if it occurs at all. Whether or not metals, or any other commodity, can have this effect on real exchange rate appreciation remains to be seen. Additionally, the definition of a resource "boom" or being resource-export reliant is not a settled one. [4] By studying this question, this paper hopes to ascertain whether or not certain types of resources lead to Dutch disease effects, and not others. Section II discusses the prior relevant literature. Section III reviews theories of the Dutch disease and what they imply. Section IV displays my empirical specification. Section V presents my results, and Section VI concludes the thesis.

[4] After all, the natural gas rents in the Netherlands that led to the Dutch disease's origination only amounted to 4.5% of Dutch GDP at their peak in 1984 (and roughly 3.2% at the time of the 1977 article in *The Economist*) (World Bank).

II. Literature Review

Many authors have studied the Dutch disease, both theoretically and empirically. Corden (1982, 1984) wrote two prominent early papers. He uses a theoretical model of an economy with three sectors: a booming exportable sector (e.g. oil), a non-booming tradable sector (e.g. manufacturing), and a non-tradable sector (e.g. services). Given an exogenous shock to the booming sector, such as an increase in the global price of that commodity, he shows how there is an appreciation of the real exchange rate of that economy and a resulting decline in the lagging tradable sector. Corden points out two effects leading to this result: the spending effect and the resource movement effect. The spending effect refers to the increased level of spending as a result of increased revenue brought in by the boom, such as the government receiving higher tax revenues from the booming sector, and spending these revenues on the economy as a whole. This increases demand and therefore prices and labor in the non-tradable sector (prices for the exportable sectors are determined on the global market and not the domestic market), shifting labor from the lagging sector to the non-tradable sector. The resource movement effect refers to the direct increase in demand for labor in the booming sector; workers move from the lagging sector to the booming sector in search of higher wages. This pushes up production in the booming sector and decreases it in the lagging sector even more.

Corden later wrote a paper outlining a specific case of the Dutch disease, namely in Australia (2012). He discussed different policy options of the Australian government, but noticeably does not do empirical analysis to back his claim of the presence of the

Dutch disease in the first place. This gap is important as Australia is sometimes assumed to be a case of a mining boom-induced Dutch disease.

Other economists have tested this theory empirically, often on a national, one-country level. For example, Ruehle and Kulkarni (2011) study potential Dutch disease effects in Chile following the copper boom in the early 2000s. They find little adverse effects in industrial output but slight de-agriculturization, and therefore conclude that the Dutch disease did occur. Their study, however, uses basic correlation matrices and single factor regression models that notably do not include the real effective exchange rate index as a dependent variable, meaning that de-agriculturization may have occurred for a host of other reasons (seasonality of agricultural production, for instance).

Beine, Bos, and Coulombe (2009) analyze the Dutch disease due to the rise of Canada's oil production in the 2000s. They implement a Bayesian approach to assess how much the Canadian Dollar is associated with commodity prices, and then use that to show commodity price changes' effects on employment. They conclude that 42 per cent of the manufacturing employment loss in Canada between 2002 and 2007 is related to the Dutch disease phenomenon.

There have been fewer studies looking at multiple countries at once, with the exceptions being studies of developing countries and of oil producing nations. Javaid (2011), for example, confirms the Dutch disease hypothesis (at least a real exchange rate appreciation and a contraction in the tradable sector) resulting from foreign inflows in South-East Asian Economies. Others have looked at the effects of oil prices on oil-exporting nations' real exchange rate (Mohammadi and Jahan-Parvar 2010) and industrial and agricultural output (Taibnia and Shakeri 2009), finding very limited support in favor of the disease. Lartey (2011) studies the importance of the financial openness of an economy for the Dutch disease, using a dataset of 109 countries, but only looking at foreign direct investment as the explanatory variable. Sachs and Warner (1995) look at the relationship between resource-intensiveness and growth, concluding that economies with high resource exports as a percentage of GDP had lower growth rates in the 1970s and 80s, after controlling for other relevant factors, but not necessarily due to real exchange rate appreciation.

Outside the Dutch disease literature, others have looked at the relationship between commodity prices and real exchange rates. Cashin, Cespedes, and Sahay (2003) examine whether real exchange rates of commodity-exporting countries and the real prices of their commodity exports move together over time, finding a relationship for about one-third of the countries. They limit their sample to those countries that were commodity-dependent over a four year span (58 in total) and use individual commodity price indices with monthly data calculated for each country.

This paper expands upon the current literature by looking at the existence of the Dutch disease in a broad array of economies, including those that are relatively resource reliant and those that are not. Specifically, it will do so by analyzing the shock of a real commodity price index on a country's real effective exchange rate.

III. Theoretical Framework

As mentioned earlier, the seminal model explaining the Dutch disease theory comes from Corden and Neary (1982) and Corden (1984). The Core Model discussed has three sectors: the Booming Sector (B), the Lagging Sector (L), and the Non-Tradable

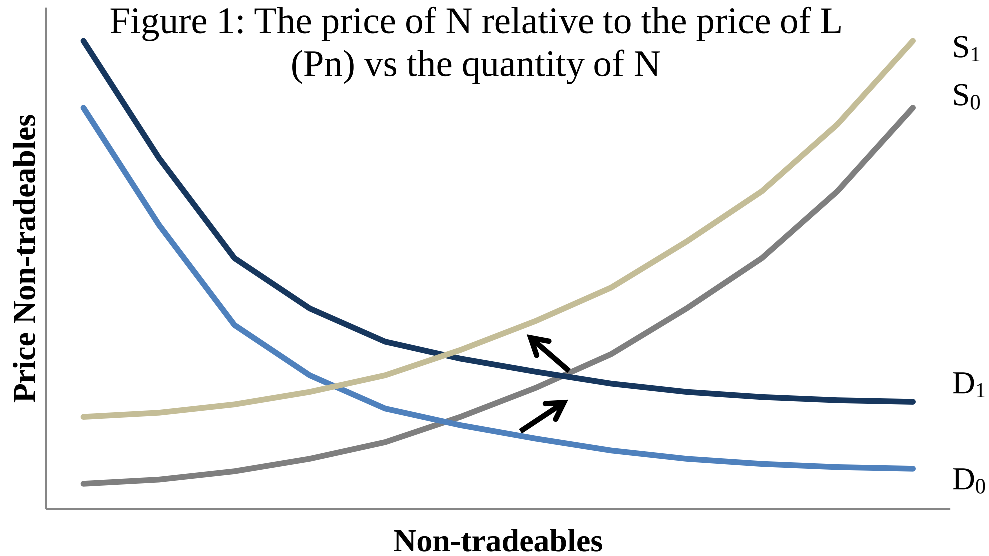
Sector (N). Corden (1984) describes three events that can provide an impetus for a boom in B: technical innovation leading to an increase in output in B (such as the invention of fracking), a discovery of new untapped resources, or an exogenous price rise on the global market of the booming sector good relative to the price of the country's imports. In this third case, the booming sector is initially assumed to be entirely exported, or the domestic prices are detached from the global market price (as is the case in some oil producing countries), which means that it does not have direct domestic inflationary pressures.

As B booms from one or more of these events, aggregate incomes rise for all of the factors initially employed there. Assuming at least part of this extra income is spent on non-tradeable goods and services, N, the aforementioned *spending effect* takes place. The price of N relative to the prices of tradables must rise, since N's price is set on the domestic market the exporting sectors' prices are set globally (and are thus stable, except for the third case, where P_B rises but is not consumed domestically, and so would not affect the country's price level). This price rise is a *real appreciation*, and can be defined by this equation:

$$REER = NER\ (P^*/P) \tag{1}$$

In (1), REER is the real effective exchange rate, NER is the nominal exchange rate between any two countries (specifically home currency unit per foreign currency unit), P* is the foreign country's price level, and P is the domestic price level. Note that REER appreciates even under fixed exchange rate regimes, as domestic inflation outpaces foreign inflation due to this spending effect.

In Figure 1, the vertical axis shows P_n, which under the Core Model is the price of non-tradeable goods and services relative to that of the lagging exportable sector. The demand curve shows demand for non-tradeable goods and services, where income equals expenditure at all levels. The spending effect shifts demand from D_0 to D_1, raising P_n.



In addition, the marginal product of labor increases in B, the booming sector, raising demand for labor and thus wages in that sector, which is the *resource movement effect*. This moves labor out of L, the lagging sector, and into B, lowering the lagging sector's employment and output, which is called *direct de-industrialization.* Corden notes that *de-industrialization* is merely shorthand, as the lagging sector could just as easily be comprised primarily of agriculture, for instance. Labor also moves from the non-tradeable sector, N, and into B, decreasing the supply of N and further appreciating the real exchange rate. This is shown in Figure 1 by the shift to the left of the supply curve from S_0 to S_1. The price rise in non-tradeables reinforces the de-industrialization of the lagging sector, as it attracts more workers via higher wages to move out of L and into N, an exodus Corden calls *indirect de-industrialization*.

The end result is a weakening in competitiveness in the lagging export sector due to exchange rate appreciation and higher wage pressures causing lower output in this traditional export sector. This Core Model rests on some simplifying assumptions, namely intra-sector labor mobility, and international labor and capital immobility. It also assumes the income gain in the booming sector is totally consumed and not invested. Relaxing these assumptions tends to mitigate the effects, but not the overall trend of a decline in L (Corden 1984).

For example, he considers cases where the Booming Sector product is not entirely exported, and there is some domestic absorption effect. If the Booming product is a final consumption good, its price rise will lead to a positive spending (income) effect driven by B's owners and workers buying more of everything, a negative spending (income) effect driven by people from the other sectors buying less of everything, and a substitution effect in which everyone buys less of the booming good and more of the other goods (L and N). This would likely lead to real appreciation; the resource movement effect is the same. On the other hand, if the booming product is an intermediate good, such as Oil, the matter is slightly more complicated. Income in the lagging and non-tradeable sectors falls, leading to a negative spending effect. This may or may not cancel out a positive spending effect driven by rising income in the booming sector. The resource movement effect in this case will be greater, since the marginal product of labor falls in L and N due to the higher input price of oil squeezing the values added per unit in those sectors.

IV. Empirical Specification

Using this Core Model, one can test the Dutch disease hypothesis empirically. First, the real exchange rates need to be calculated. Using (1) as a base, CPIs of the given countries can act as proxies for the relative price levels, as can GDP deflators. The ratio of the different inflation levels merely needs to be multiplied by the spot exchange rate to achieve a real exchange rate. The problem with using a bilateral rate, of course, is that it not only depends on the country experiencing the boom but the other nation in question; very few currencies have remained stable over long periods of time, meaning that the effects of the two country's currencies need to be separated. This paper will instead use the real effective exchange rate index. The REER index represents the ratio of a currency's period-average exchange rate to a weighted geometric average of exchange rates of selected countries weighted by trade amount (this ratio being the nominal effective exchange rate). It is adjusted for relative changes in consumer prices, a proxy of cost indicators of the home country. This REER data comes from the International Financial Statistics (IFS) database from the World Bank, and has data for 93 countries dating back to 1967 for Finland.[5] The Dutch disease hypothesis suggests a positive relationship between world resource prices, domestic resource output and the real exchange rate. This relationship can be written in a log-linear form as:

(2) $$\Delta \log REER_t = \beta_0 + \beta_1 \Delta \log p_t + \epsilon_t$$

[5] 1975 is the starting year for this analysis, primarily due to the lack of data on other nations' REER until that year. See Appendix B for a description of the statistical methodology

where REER is the real effective exchange rate, p_t represents a commodity price index, and ϵ_t is the error term, with t measured in years.[6] The Core Model assumes a small open economy where resource prices are determined in the global market, thus p_t is exogenous.

I expand (2) to further consider a country's level of resource intensity using the following equation:

(3) $\Delta\log REER_{it} = \beta_0 + \beta_1 \Delta\log p_t + \beta_2 ResourceIntensity_{it} + \beta_3 \Delta\log p_t * ResourceIntensity_{it} + \epsilon_t$

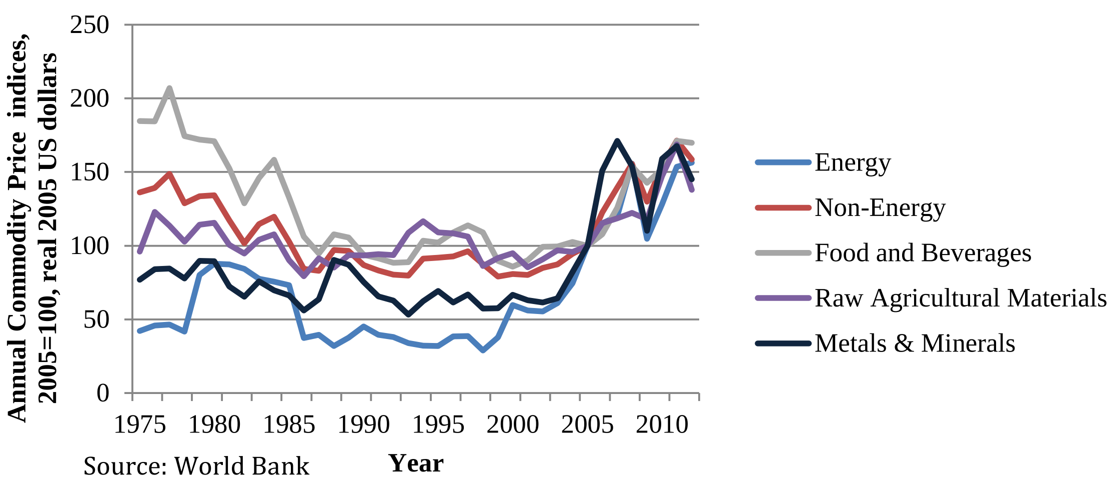
ResourceIntensity is a dummy variable that equals 1 when country *i* is considered relatively resource export-intensive in a given year *t*.[7] β_3 is the coefficient on the interaction term between the commodity price index and the dummy, and thus measures the additional effect that a commodity price index would have on the real effective exchange rate if the country is exporting a relatively large amount of resources at the time. This term is important since theoretically commodity prices might have little to no relationship with a country's real exchange in general, but could be associated with real exchange rate appreciation for those countries who export a significant amount of those kinds of resources. Finally, equation (3) is run with *ResourceIntensity* not representing a dummy variable but rather the country's resource exports as a percentage of GDP in a given year. This version of the regression can deal with some of the potential issues of using the dummy variable, namely that it can average out and potentially mask some individual effects, and is affected by the choice of intensity threshold chosen. If there is a linear relationship between resource exports as a percentage of GDP multiplied by a commodity price index and the country's real effective exchange rate, it could be shown

[6] Mohommadi and Parvar (2010).
[7] The cutoff for this measure is discussed later

via this regression. Even though this approach will not prove causal effects, showing potentially strong correlation is still worthwhile.

Real Commodity Price Indices come from the World Bank, which compiles weighted indices of energy and non-energy commodity prices.[8] The non-energy price index is split up into agriculture (which includes agricultural raw materials, food, and beverage indices), metals & minerals, and fertilizers.[9] These indices are trade-weighted by exports, and are deflated using the Manufactures Unit Value (MUV) index, a proxy for the price of developing country imports of manufactures in US dollar terms, used to assess cost escalation for imported goods. 2005 is the base year. I looked at annual data in order to parse out much of the noise that exists in short-term foreign exchange markets. Figure 2 below shows the trends of the indices by resource type over time. While the commodity composition of the price indices does not 100% align with the composition of resource export type, their make-ups are similar enough to proxy for the relevant index for each type. See Appendix A for weights and other details.

Figure 2: Commodity Price Indices Over Time



Source: World Bank

[8] retrieved from http://data.worldbank.org/data-catalog/commodity-price-data)
[9] Fertilizers were not looked at in this paper due to a lack of export data

V. Results

I first ran a single-factor regression for each individual country over the 36 year time frame (1975-2011) per equation (1) above. If the data aligned with the theory, one would suppose that there would be no relationship (give or take) between commodity prices and real exchange rates for those countries with relatively low commodity exports, but a positive relationship for those countries with high resource-intensiveness. Since each country only has at most 36 data points, and since a multitude of different factors affect real exchange rate changes, no one individual country regression can lead to a strong conclusion. In the aggregate, though, one might think there could be a trend, with high resource-exporting nations having a higher coefficient.

Figure 3a: Metal Price Index Beta vs. Average Metal Exports/GDP by Country

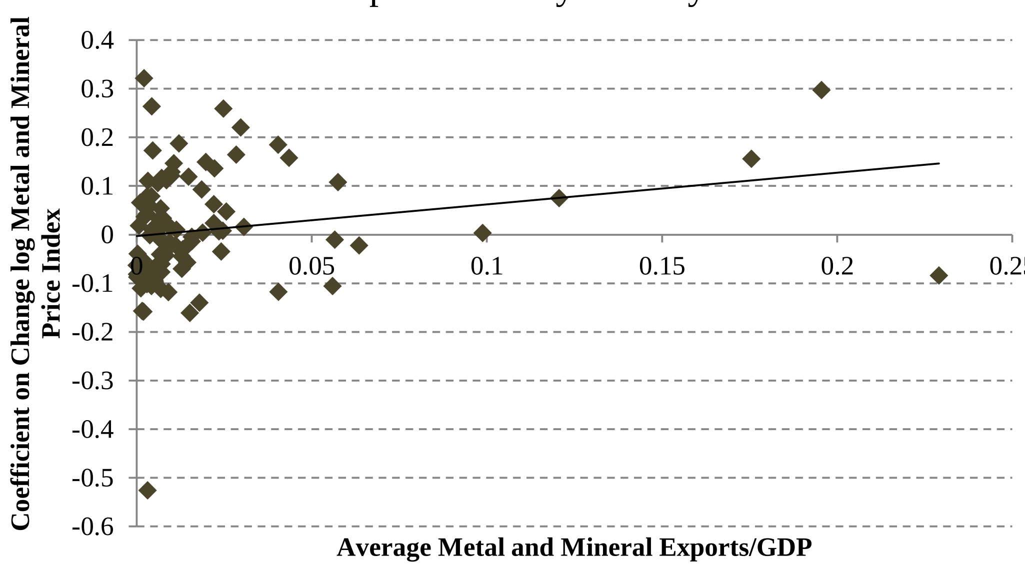
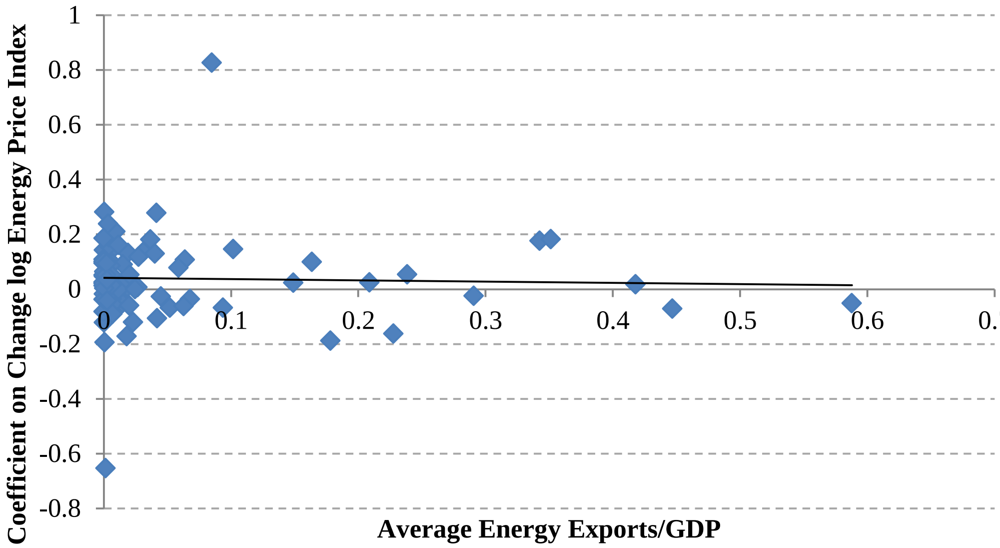


Figure 3b: Energy Price Index Beta vs. Average Energy Exports/GDP by Country



In Figures 3a and 3b, the betas from each individual country are graphed against the average exports of the relevant resource. While the positive relationship exists for Metal exports, the relationship is negative for Energy-related ones. Most of the betas were insignificant, however, and looking at the average export value for each nation over the time frame masks any resource boom and ensuing bust. The equivalent graphs for raw agricultural material and food exports can be seen in Appendix D.

In order to average out idiosyncrasies of individual countries, and to take into account possible differential effects in different commodity groupings, the countries in my sample have been sorted into bins by resource exports as a percentage of GDP in each given year (e.g., the top 50% most resource-intensive go in one group, and the bottom half the other). This sorting process was repeated to split nations by 2, 3, 5, and 10 groups per year; in other words, each country was placed into its relevant half, third, quintile, and decile of "resource export-intensiveness" for each year. In addition to sorting based on resource exports as a whole, the process was repeated by type of resource, using World Bank World Development Indicator specifications of agricultural raw materials, food, fuel, and ores & metals exports (their sum acts as the proxy for each country's total resource exports). This sorting process also helps control for the varying number of countries over the different years of the data set, which dates back to 1975 and goes through 2011. The grouping of the countries and the aggregation of resources into one variable (resource exports/GDP) helps begin to cancel out other explanatory effects.[10]

I then proceeded to run the regression in equation (1) with the dependent variable now being the average change in the REER for the countries in each bin. When viewing the various results, the hypothesis is that for countries not exporting a great deal of resources (so those in the lower-valued bins), there would not be a relationship between the commodity price index and the REER, but for high resource-exporting countries, such a relationship might exist.

[10] This sorting of countries into groups mimics techniques used in the finance literature, in which firms are sorted into groups (portfolios) based on specific characteristics, and the returns to the groups (portfolios) of firms are studied. A prominent example is Fama and French (1993), in which firms are sorted into categories based on size (market value) and value (the book value of their assets relative to market value). Similar methods are used in the literature on currency speculation (see, for example, Lustig, Roussanov and Verdelhan (2011))

Figure 4a: Energy Price Index Beta on REER by Bin

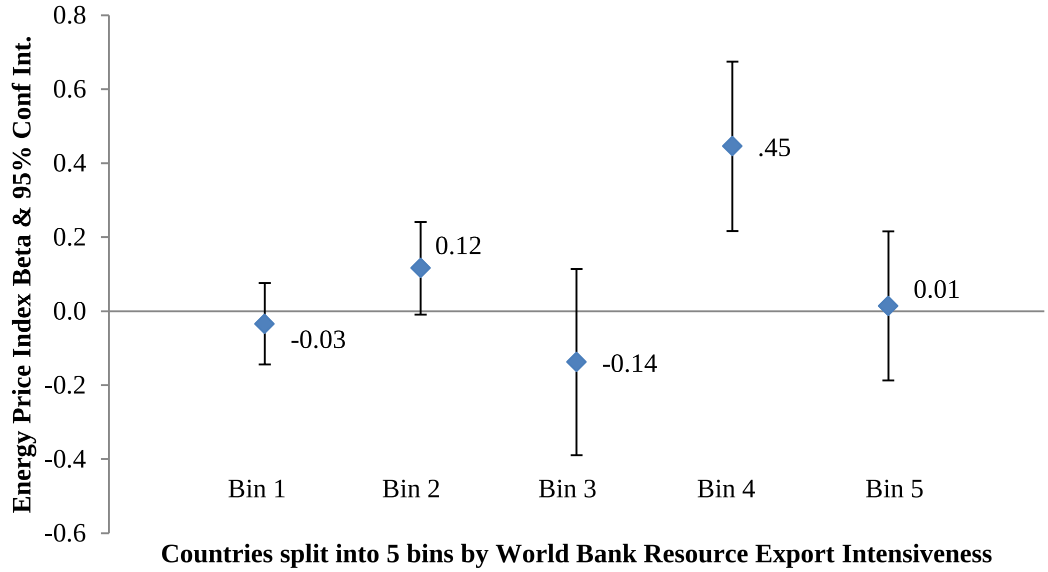
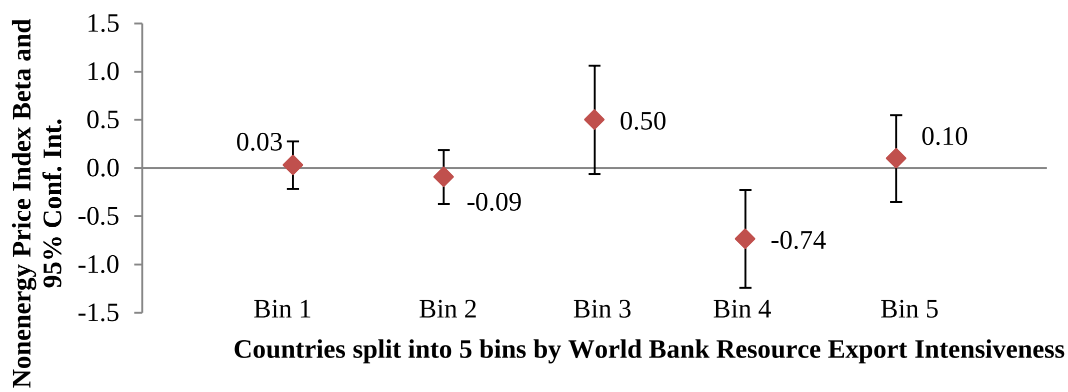


Figure 4b: Nonenergy Price Index Beta on REER by Bin



Figures 4a and 4b, however, fail to substantiate that claim. While a positive relationship can tenuously be seen for energy prices, no such relationship exists for the betas on the Nonenergy price index, casting some doubt on the theory. This lack of substantial evidence exists when countries are grouped into 2, 3, or 10 bins as well. Since the countries' resource exports were aggregated, though, it is possible some individual boom effects were masked or cancelled out. Additionally, the sorting process takes the average log change of REER for each group of countries within the bin for each year, which could bias the findings towards a non-result. Finally, outliers could have skewed some of the results due to potentially erroneous reporting of resource exports.

Next, I ran regressions of the entire data set using Equation (2) for each resource-type. I implemented the sorting-methodology to determine the resource intensiveness dummy variable. A country had a dummy value of 1 when its resource exports as a percentage of GDP fell in the top half, third, fifth, or tenth of all nations' resource exports as a percentage of GDP for each year. All 92 countries were included in the regression.

Table 1a: Results of Panel Regression (Impact on Change Ln REER of Energy Price Index, Energy Resource Intensiveness dummy, and Price Intensiveness interaction term, by country and year)

Dependent Variable:	Change Ln REER Column I	Change Ln REER Column II	Change Ln REER Column III	Change Ln REER Column IV
Resource Intensity Dummy cutoff:	Energy Exports /GDP =Top 50%	Energy Exports /GDP =Top 33%	Energy Exports /GDP =Top 25%	Energy Exports /GDP =Top 10%
Change Ln Energy Price Index	0.039 (1.78)	0.045 (2.27)*	0.042 (2.34)*	0.060 (3.09)**
Energy Resource Intensity Dummy	0.002 (0.34)	-0.002 (0.37)	-0.015 (2.50)*	-0.015 (1.88)
Price-Resource Dummy Interaction	0.028 (1.34)	0.023 (1.04)	0.047 (1.82)	-0.060 (1.72)
Constant	-0.005 (0.96)	-0.003 (0.73)	-0.001 (0.22)	-0.002 (0.56)
R^2	0.01	0.01	0.01	0.01
N	2,018	2,018	2,018	2,018

* $p<0.05$; ** $p<0.01$

Table 1b: Results of Panel Regression (Impact on Change Ln REER of Metals Price Index, Metal Resource Intensiveness dummy, and Price Intensiveness interaction term, by country and year)

Dependent Variable:	Change Ln REER Column I	Change Ln REER Column II	Change Ln REER Column III	Change Ln REER Column IV
Resource Intensity Dummy cutoff:	Metal Exports /GDP =Top 50%	Metal Exports /GDP =Top 33%	Metal Exports /GDP =Top 25%	Metal Exports /GDP =Top 10%
Change Ln Metal Price Index	-0.020 (1.02)	-0.010 (0.61)	-0.003 (0.22)	0.007 (0.48)
Metal Resource Intensity	0.003 (0.57)	0.002 (0.33)	-0.001 (0.19)	-0.006 (0.69)
Price-Resource Interaction	0.058 (2.15)*	0.058 (2.04)*	0.067 (1.94)	0.029 (0.62)
Constant	-0.003 (1.00)	-0.003 (0.88)	-0.002 (0.69)	-0.002 (0.61)
R^2	0.00	0.00	0.00	0.00
N	2,018	2,018	2,018	2,018

* $p<0.05$; ** $p<0.01$

In Table 1a, the only significant variable at the 1% level is the price index itself, which has a positive relationship with countries' REERs with a coefficient of around .05. Since these are log differences, I can interpret the coefficient as an elasticity, implying that if the energy price index changes by one percent, the real effective exchange rate would be expected to change by ~.039-.06%, which is notable for being so small. The price-resource intensity interaction term has a positive coefficient but is insignificant. If it were significant, an energy price index change would be associated with a higher change on REERs for countries experiencing energy resource booms, which would support the hypothesis. Moreover, the overall R^2 values are .01, implying that this model is not a good fit and that commodity price indices have very little explanatory power.

The lack of a good fit of the model is not limited to the energy realm. Indeed, when looking at minerals and metals, the R^2 values drop to almost zero, as seen in Table 1b. In this case, the metal price index is statistically insignificant, and though the price-resource intensity interaction term is positive in each case, it is only statistically significant when the top half and top third of countries (again, as judged by their metal & mineral exports as a percentage of GDP) were considered resource intensive. It should be fairly intuitive, though, that a country who relatively exports the 29^{th} most minerals, for instance, might not be experiencing a "mineral boom" in the colloquial sense. It follows that Columns III and IV of the regression (top fifth and top tenth columns) might better fit the theory than the first two versions. Since the coefficient on the price-resource intensity dummy interaction term is insignificant in both of those cases, it is fair to fail to conclude that the data (at least in this simple model) substantially supports the theory. The grouping strategy, though, averages out country-specific variance within each bin. This means that countries without a 'disease' relationship could mask the cases where it does occur. Thus, this grouping technique could have biased the results towards a non-finding.

To correct for this potential issue, I substituted resource exports as a percentage of GDP for the dummy variable (and in the interaction term). Table 2 presents results for this set of panel regressions. The overall results are fairly consistent with the dummy-variable version. There are few significant variables, with only the energy and food/beverage price indices being significant at the 1% level. The only interaction that backs up the theory is the metal export one. Fixed Effects results can be seen in Appendix E.

Table 2: Results of Panel Regression (Impact on change Ln REER of change Ln commodity price indices, resource exports/GDP, and interaction term using 92 Countries from 1975-2011, random effects)

	Change Ln REER
Change Ln Agricultural Raw Material Price Index	-0.108
	(2.26)*
Change Ln Food/Beverage Price Index	0.119
	(2.87)**
Change Ln Energy Price Index	0.072
	(3.42)**
Change Ln Metal Price Index	-0.042
	(1.47)
Agricultural Raw Material Exports/GDP	0.022
	(0.17)
Food/Beverage Exports/GDP	-0.033
	(0.87)
Energy Exports/GDP	-0.039
	(1.71)
Metal Exports/GDP	0.011
	(0.24)
Agricultural Raw Material Exports-Price Interaction	-0.292
	(0.26)
Food/Beverage Exports-Price Interaction	0.099
	(0.32)
Energy Exports-Price Interaction	0.014
	(0.13)
Metal Exports-Price Interaction	0.547
	(2.11)*
Constant term	0.001
	(0.18)
R^2	0.03
N	2,018

* p<0.05; ** p<0.01

VI. Conclusion

While a subset of the data could be interpreted as supportive of the Dutch disease theory, the overall findings are generally insignificant and inconclusive. While the regressions used in this paper are too simplistic to have causal implications, the lack of support for the theory shown by the data should not provide a Dutch disease believer with much reason for optimism. While further and more advanced analysis is warranted, the results imply that it is at least plausible that no such relationship exists. Nevertheless, one should not ignore the shortcomings in this undertaking. Empirical results are subject to measurement errors and data limitations. Furthermore, grouping the commodities (rather than looking at each specific resource individually) limits possible commodity-specific disease findings and could have hidden important idiosyncratic Dutch disease phenomena. Nonetheless, according to Corden's theory, it should not matter which resource is booming, so perhaps that drawback is not as limiting as it may appear. Additionally, the omitted variable bias present in this paper would presumably bias the results towards displaying a relationship. Since it doesn't, more reason exists to not give much credence to the theory. Regardless, future analyses looking at potential Dutch disease effects should be sure to look at real exchange rate changes and not purely output and employment changes, since if the real exchange rate did not change, another theory might better explain the phenomenon (should it occur).

Appendix A: Commodity Price Index Weights

Weights Used in the World Bank Commodity Price Index (in Percent) 1/

based on 2002-04 developing countries' export values 2/ and 3/

Commodity Type	Share of energy and non-energy indices	Share of sub-group indices
Energy	**100.0**	**100.0**
Coal	4.7	4.7
Crude Oil	84.6	84.6
Natural Gas	10.8	10.8
Non-energy Commodities		
Agriculture	**64.9**	
Food 7/	40.0	
Cereals	11.3	**100.0**
Rice	3.4	30.2
Wheat	2.8	25.3
Maize 4/	4.6	40.8
Barley	0.5	3.7
Vegetable Oils and Meals	16.3	**100.0**
Soybeans	4.0	24.6
Soybean Oil	2.1	13.0
Soybean Meal	4.3	26.3
Palm Oil	4.9	30.2
Coconut Oil	0.5	3.1
Groundnut Oil 5/	0.5	2.8
Other Food	12.4	**100.0**
Sugar	3.9	31.5
Bananas	1.9	15.7
Meat, beef	2.7	22.0
Meat, chicken	2.4	19.2
Oranges 6/	1.4	11.6
Beverages 7/	8.4	**100.0**
Coffee	3.8	45.7
Cocoa	3.1	36.9
Tea	1.5	17.4
Agricultural Raw Materials	16.5	
Timber	8.6	
Hardwood	8.6	
Logs	1.9	
Sawnwood	6.7	
Other Raw Matrials	7.9	
Cotton	1.9	
Natural Rubber	3.7	
Tobacco	2.3	

Metals and Minerals	**31.6**	**100.0**
Aluminum	8.4	26.7
Copper	12.1	38.4
Iron Ore	6.0	18.9
Lead	0.6	1.8
Nickel	2.5	8.1
Tin	0.7	2.1
Zinc	1.3	4.1
Fertilizers	**3.6**	**100.0**
Natural Phosphate Rock	0.6	16.9
Phosphate	0.8	21.7
Potassium	0.7	20.1
Nitogenous	1.5	41.3

Notes:

Differences in group totals and components are due to rounding.

1/ Laspeyres Index.

2/ Developing countries is represented by Low- and Middle-income Countries (LMIC) as defined by the World Bank Development Data Group Classification of Income Group as of June 20, 2006.

3/ Trade data sources are United Nations' Comtrade Database via World Bank WITS system, Food and Agriculture Organization FAOSTAT Database, International Energy Agency Database, BP Statistical Review of World Energy, World Metal Statistics, World Bureau of Metal Statistics and World Bank staff estimates.

4/ The maize weight includes sorghum.

5/ The groundnut oil weight includes groundnuts.

6/ The oranges weight includes orange juice.

7/ Food and Beverage index combined by weight into nonenergy price index (so Food index received 40/48.4 weight, and Beverage index received 8.4/48.4 weight)

Appendix B: Real Effective Exchange Rate and Merchandise Exports Methodology

From the World Bank World Development Indicators Metadata:

> The real effective exchange rate is a nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country, selected countries, and the euro area. A nominal effective exchange rate index is the ratio (expressed on the base 2005 = 100) of an index of a currency's period-average exchange rate to a weighted geometric average of exchange rates for currencies of selected countries and the euro area. For most high-income countries weights are derived from industrial country trade in manufactured goods. Data are compiled from the nominal effective exchange rate index and a cost indicator of relative normalized unit labor costs in manufacturing. For selected other countries the nominal effective exchange rate index is based on manufactured goods and primary products trade with partner or competitor countries. For these countries the real effective exchange rate index is the nominal index adjusted for relative changes in consumer prices; an increase represents an appreciation of the local currency.

> Merchandise Exports are recorded as the cost of the goods delivered to the frontier of the exporting country for shipment - the free on board (f.o.b.) value. Countries may report trade according to the general or special system of trade**. Under the general system exports comprise outward-moving goods that are (a) goods wholly or partly produced in the country; (b) foreign goods, neither transformed nor declared for domestic consumption in the country, that move outward from customs storage; and (c) goods previously included as imports for domestic consumption but subsequently exported without transformation**. Under the special system exports comprise categories a and c. In some compilations categories b and c are classified as re-exports. Because of differences in reporting practices, data on exports may not be fully comparable across economies. Data on exports of goods are derived from the same sources as data on imports. In principle, world exports and imports should be identical. Similarly, exports from an economy should equal the sum of imports by the rest of the world from that economy. But differences in timing and definitions result in discrepancies in reported values at all levels.

Appendix C: Country Average Resource Exports and Overall Data Summary

Country	Avg Ln REER	Avg Energy Exp.	Avg Raw Agric. Mat. Exp.	Avg Metal Exp.	Avg Food/Bev Exp.	Avg Tot Res. Exp.
Algeria	4.46	29.08%	0.17%	0.20%	2.41%	31.86%
Antigua and Barbuda	3.67	0.01%	0.78%	1.21%	3.23%	5.24%
Armenia	4.67	0.61%	0.39%	4.05%	2.23%	7.27%
Australia	4.06	3.10%	1.39%	2.85%	3.38%	10.72%
Austria	3.99	0.70%	0.94%	0.95%	3.18%	5.76%
Bahamas	4.27	58.79%	0.34%	0.70%	2.87%	62.69%
Bahrain	3.89	20.88%	0.14%	22.91%	3.12%	47.05%
Belgium	3.89	4.50%	1.45%	2.47%	6.25%	14.67%
Belize	3.94	1.84%	0.95%	0.16%	21.47%	24.43%
Bolivia	4.01	8.50%	0.35%	5.66%	3.21%	17.72%
Bulgaria	4.55	4.19%	0.88%	5.60%	5.23%	15.90%
Burundi	4.34	0.03%	0.28%	0.30%	4.98%	5.58%
Cameroon	3.70	5.19%	2.69%	1.30%	6.58%	15.76%
Canada	4.09	4.00%	2.16%	1.98%	2.85%	11.00%
Central African Republic	3.74	0.02%	3.08%	4.05%	1.42%	8.58%
Chile	4.04	0.30%	1.81%	12.06%	5.58%	19.75%
China	4.15	0.64%	0.31%	0.64%	2.80%	4.40%
Colombia	4.03	3.67%	0.59%	0.46%	3.63%	8.35%
Costa Rica	3.93	0.20%	1.14%	0.44%	12.80%	14.57%
Cote d'Ivoire	3.69	6.79%	4.64%	0.61%	19.22%	31.26%
Croatia	4.56	2.30%	0.96%	0.71%	2.45%	6.42%
Cyprus	3.94	0.60%	0.23%	0.79%	4.79%	6.42%
Czech Republic	4.66	1.91%	0.93%	1.14%	2.32%	6.29%
Denmark	4.17	1.48%	0.90%	1.47%	6.37%	10.22%
Dominica	4.16	0.00%	0.11%	0.52%	9.29%	9.91%
Dominican Republic	3.68	0.36%	0.43%	0.69%	7.40%	8.88%
Ecuador	3.97	9.36%	0.66%	0.16%	7.15%	17.33%
Equatorial Guinea	3.31	0.00%	0.01%	0.04%	6.90%	6.94%
Fiji	3.74	0.01%	0.79%	0.30%	19.07%	20.17%
Finland	4.44	1.05%	2.54%	0.97%	1.17%	5.72%
France	4.32	0.63%	0.39%	1.58%	2.66%	5.26%
Gabon	3.75	41.79%	5.09%	1.80%	2.07%	50.76%
Gambia	3.86	0.00%	0.66%	0.72%	4.84%	6.22%
Georgia	4.67	0.69%	0.25%	2.21%	3.03%	6.17%
Germany	4.63	0.56%	0.27%	0.71%	1.31%	2.85%
Ghana	4.24	1.80%	1.51%	2.23%	14.23%	19.76%
Greece	3.90	0.83%	0.35%	0.73%	3.75%	5.66%
Grenada	4.27	0.00%	0.03%	0.45%	8.44%	8.92%
Guyana	4.79	0.00%	2.95%	9.88%	35.32%	48.16%
Hungary	3.69	1.51%	1.36%	1.11%	6.15%	10.13%
Iceland	4.09	0.10%	0.20%	4.36%	15.93%	20.59%
Iran	3.97	17.82%	0.11%	0.43%	0.96%	19.32%
Ireland	4.26	0.34%	0.63%	0.60%	9.94%	11.50%
Israel	4.45	0.05%	0.50%	0.38%	2.38%	3.30%
Italy	4.26	0.71%	0.25%	0.43%	2.12%	3.51%
Japan	4.38	0.07%	0.09%	0.30%	0.24%	0.70%
Kiribati	4.69	0.00%	0.31%	0.02%	9.13%	9.46%
Lesotho	4.46	0.04%	1.57%	0.22%	4.13%	5.95%
Luxembourg	4.60	0.27%	0.47%	2.42%	3.10%	6.26%
Macedonia, FYR	4.66	1.35%	0.59%	2.57%	5.56%	10.07%
Malawi	4.22	0.02%	0.68%	1.53%	17.63%	19.86%
Malaysia	4.60	10.16%	6.57%	1.86%	8.58%	27.18%
Malta	4.31	1.19%	0.11%	0.19%	2.83%	4.32%
Mexico	3.88	4.13%	0.26%	0.76%	2.95%	8.10%
Moldova	4.69	0.14%	0.75%	1.30%	20.88%	23.07%
Morocco	3.94	0.42%	0.45%	3.07%	3.94%	7.88%
Netherlands	4.44	6.27%	1.73%	1.33%	9.01%	18.33%
New Zealand	4.18	0.48%	3.66%	0.99%	10.19%	15.33%
Nicaragua	5.52	0.14%	1.03%	0.32%	10.64%	12.13%
Nigeria	4.03	34.26%	0.40%	0.13%	1.16%	35.94%
Norway	4.43	14.90%	0.46%	2.21%	1.91%	19.47%

Country	Avg Ln REER	Avg Energy Exp.	Avg Raw Agric. Mat. Exp.	Avg Metal Exp.	Avg Food/Bev Exp.	Avg Tot Res. Exp.
Pakistan	3.81	0.43%	0.85%	0.10%	2.67%	4.05%
Papua New Guinea	4.15	6.39%	3.06%	17.55%	12.81%	39.81%
Paraguay	4.26	0.54%	2.72%	0.43%	12.42%	16.12%
Philippines	4.54	0.39%	0.52%	1.48%	4.44%	6.83%
Poland	5.20	0.93%	0.27%	0.86%	1.72%	3.78%
Portugal	4.37	0.61%	0.89%	0.67%	1.91%	4.08%
Romania	4.01	2.01%	0.97%	1.01%	1.59%	5.57%
Russian Federation	4.56	16.35%	0.86%	2.49%	0.52%	20.22%
Saint Kitts and Nevis	4.45	0.00%	0.05%	0.01%	6.39%	6.44%
Saint Lucia	4.51	0.00%	0.11%	0.05%	11.42%	11.58%
Saint Vincent and the Grenadines	4.65	0.02%	0.02%	0.03%	11.10%	11.16%
Samoa	4.22	0.04%	0.24%	0.72%	3.94%	4.95%
Saudi Arabia	4.00	44.70%	0.32%	0.53%	1.94%	47.49%
Singapore	4.57	23.84%	4.70%	2.35%	6.59%	37.48%
Slovak Republic	4.49	2.65%	0.89%	1.58%	2.12%	7.23%
Solomon Islands	3.99	0.00%	5.36%	0.27%	11.93%	17.56%
South Africa	4.51	2.44%	0.53%	5.75%	2.02%	10.75%
Spain	4.53	0.59%	0.21%	0.39%	2.20%	3.38%
Sweden	4.71	1.14%	1.83%	1.07%	0.88%	4.92%
Switzerland	4.59	0.27%	0.16%	0.84%	0.76%	2.03%
Togo	3.79	0.68%	4.25%	6.35%	5.01%	16.29%
Tonga	4.33	0.00%	0.86%	0.08%	7.21%	8.15%
Trinidad and Tobago	4.65	35.12%	0.03%	0.24%	2.19%	37.58%
Tunisia	4.90	5.87%	0.21%	0.66%	2.88%	9.62%
Uganda	4.49	0.19%	1.90%	0.33%	6.95%	9.37%
Ukraine	4.64	2.73%	0.53%	2.98%	5.30%	11.54%
United Kingdom	4.48	2.02%	0.19%	0.61%	1.26%	4.08%
Uruguay	3.95	0.22%	1.91%	1.45%	6.83%	10.41%
USA	4.53	0.26%	0.24%	0.20%	1.33%	2.03%
Venezuela	4.03	22.76%	0.10%	0.91%	2.12%	25.89%
Zambia	3.79	0.35%	0.90%	22.37%	3.35%	26.98%

	Average	Max	Min	Variance	Standard Deviation
Year	1995	2011	1975	127.29	11.28
Ln REER	4.70	13.10	3.77	0.25	0.50
Agricultural Raw Material Exports (% GDP)	1.12%	24.10%	0.00%	0.00	0.02
Food and Beverage Exports (% GDP)	5.84%	75.51%	0.00%	0.01	0.07
Metals & Mineral Exports (% GDP)	1.97%	64.34%	0.00%	0.00	0.05
Energy Exports (% GDP)	5.33%	423.16%	0.00%	0.03	0.17
Energy Price Index	68.23	156.26	28.92	1405.35	37.49
Non-Energy Price Index	109.59	171.35	79.05	728.82	27.00
Agricultural Raw Material Price Index	105.55	168.67	79.23	324.81	18.02
Food & Beverage Price Index	126.70	207.06	85.83	1188.25	34.47
Metals & Minerals Price Index	86.21	171.22	53.26	1159.92	34.06

Appendix D: Graphs of Country-Specific Coefficients on Price Indices against Resource Exports

Figure 3c: Food and Beverage Price Index Beta vs. Avg Food and Beverage Exports/GDP by Country

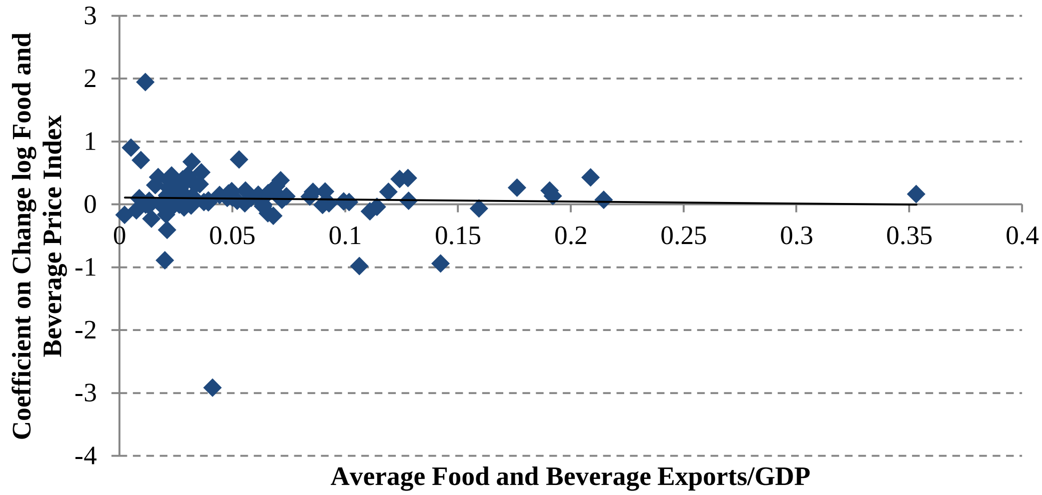
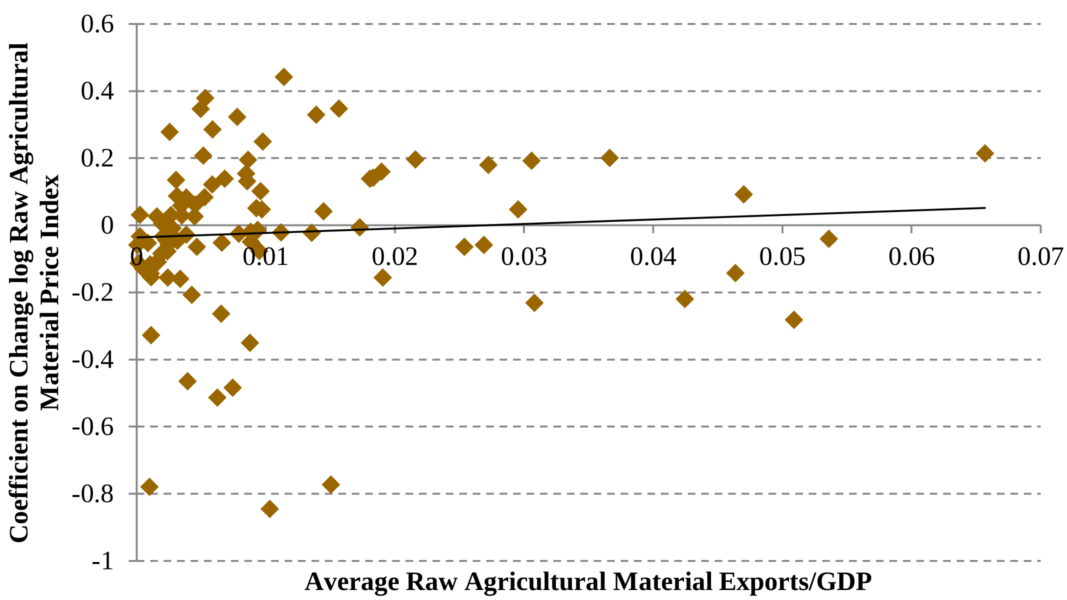


Figure 3d: Agricultural Price Index Beta vs. Avg Raw Agricultural Material Exports/GDP by Country



Appendix E: Panel Regression Result Tables

Table 1c: Results, continued (Metal/Mineral Exports Fixed Effect)

Dependent Variable:	Change Ln REER	Change Ln REER	Change Ln REER	Change Ln REER
Resource Intensity Dummy cutoff:	Metal Exports /GDP =Top 50%	Metal Exports /GDP =Top 33%	Metal Exports /GDP =Top 25%	Metal Exports /GDP =Top 10%
Change Ln Metal Price Index	-0.021	0.018	-0.070	0.059
	(0.30)	(0.29)	(0.92)	(1.38)
Metal Resource Intensity	6.848	5.001	4.102	0.752
	(4.17)**	(5.32)**	(7.09)**	(5.07)**
Price-Resource Interaction	0.940	-3.680	1.748	-1.048
	(0.09)	(0.70)	(0.52)	(1.32)
_cons	-0.041	-0.055	-0.088	-0.035
	(4.32)**	(5.45)**	(7.09)**	(5.06)**
R^2	0.01	0.02	0.03	0.01
N	2,018	2,018	2,018	2,018

* p<0.05; ** p<0.01

Table 1d: Results, continued (Energy Exports Fixed Effect)

Dependent Variable:	Change Ln REER	Change Ln REER	Change Ln REER	Change Ln REER
Resource Intensity Dummy cutoff:	Energy Exports /GDP =Top 50%	Energy Exports /GDP =Top 33%	Energy Exports /GDP =Top 25%	Energy Exports /GDP =Top 10%
Change Ln Energy Price Index	0.048	0.052	0.054	0.048
	(3.08)**	(3.88)**	(4.43)**	(4.23)**
Energy Resource Intensity	0.003	0.001	0.014	0.010
	(0.54)	(0.12)	(1.71)	(0.89)
Price-Resource Interaction	-0.011	-0.028	-0.053	-0.056
	(0.48)	(1.19)	(1.93)	(1.51)
Constant	-0.005	-0.004	-0.006	-0.005
	(1.30)	(1.13)	(2.15)*	(1.68)
R^2	0.01	0.01	0.01	0.01
N	2,018	2,018	2,018	2,018

* p<0.05; ** p<0.01

Table 1e: Results, cont. (Agricultural Material Exports Fixed Effect)

Dependent Variable:	Change Ln REER	Change Ln REER	Change Ln REER	Change Ln REER
Resource Intensity Dummy cutoff:	Agricultural Exports/GDP =Top 50%	Agricultural Exports/GDP =Top 33%	Agricultural Exports/GDP =Top 25%	Agricultural Exports/GDP =Top 10%
Change Ln Agricultural Price Index	0.201 (1.61)	0.158 (1.62)	0.013 (0.13)	0.154 (2.01)*
Agricultural Material Resource Intensity	-1.740 (0.66)	-1.318 (1.09)	-1.313 (2.11)*	-0.393 (1.36)
Price-Resource Interaction	-57.660 (1.80)	-20.729 (1.91)	-2.772 (0.43)	-6.431 (2.52)*
Constant	0.005 (0.45)	0.009 (0.84)	0.018 (1.81)	0.007 (0.86)
R^2	0.00	0.00	0.00	0.00
N	2,018	2,018	2,018	2,018

* p<0.05; ** p<0.01

Table 1f: Results, cont. (Agricultural Material Exports Random Effect)

Dependent Variable:	Change Ln REER	Change Ln REER	Change Ln REER	Change Ln REER
Resource Intensity Dummy cutoff:	Agricultural Exports/GDP =Top 50%	Agricultural Exports/GDP =Top 33%	Agricultural Exports/GDP =Top 25%	Agricultural Exports/GDP =Top 10%
Change Ln Agricultural Price Index	0.184 (1.49)	0.141 (1.47)	0.012 (0.12)	0.155 (2.06)*
Agricultural Raw Material Resource Intensity	-2.001 (0.78)	-1.558 (1.33)	-1.350 (2.27)*	-0.429 (1.55)
Price-Resource Interaction	-52.164 (1.64)	-18.448 (1.72)	-2.508 (0.40)	-6.400 (2.54)*
Constant	0.006 (0.56)	0.011 (1.06)	0.018 (1.94)	0.008 (1.02)
R^2	.004	. 005	.004	.004
N	2,018	2,018	2,018	2,018

* p<0.05; ** p<0.01

Table 1g: Results, continued (Food and Beverage Exports Random Effect)

Dependent Variable:	Change Ln REER	Change Ln REER	Change Ln REER	Change Ln REER
Resource Intensity Dummy cutoff:	Food/Beverage Exports/GDP =Top 50%	Food/Beverage Exports/GDP =Top 33%	Food/Beverage Exports/GDP =Top 25%	Food/Beverage Exports/GDP =Top 10%
Change Ln Food/Beverage Price Index	0.138	0.117	0.101	0.104
	(4.55)**	(4.42)**	(4.18)**	(4.57)**
Food/Beverage Resource Intensity	-0.002	-0.004	-0.003	-0.013
	(0.47)	(0.85)	(0.53)	(1.50)
Price-Resource Interaction	-0.054	-0.016	0.059	0.094
	(1.25)	(0.35)	(1.06)	(1.21)
Constant	-0.001	-0.001	-0.002	-0.002
	(0.44)	(0.42)	(0.78)	(0.63)
R^2	0.01	0.01	0.01	0.01
N	2,018	2,018	2,018	2,018

* p<0.05; ** p<0.01

Table 1h: Results, continued (Food and Beverage Exports Fixed Effect)

Dependent Variable:	Change Ln REER	Change Ln REER	Change Ln REER	Change Ln REER
Resource Intensity Dummy cutoff:	Food/Beverage Exports/GDP =Top 50%	Food/Beverage Exports/GDP =Top 33%	Food/Beverage Exports/GDP =Top 25%	Food/Beverage Exports/GDP =Top 10%
Change Ln Food/Beverage Price Index	0.136	0.114	0.099	0.102
	(4.38)**	(4.22)**	(4.01)**	(4.41)**
Food/Beverage Resource Intensity	-0.011	-0.009	-0.000	-0.024
	(1.17)	(0.99)	(0.02)	(1.71)
Price-Resource Interaction	-0.058	-0.020	0.047	0.063
	(1.29)	(0.41)	(0.82)	(0.79)
Constant	0.003	0.000	-0.003	-0.001
	(0.54)	(0.11)	(0.84)	(0.22)
R^2	0.01	0.01	0.01	0.01
N	2,018	2,018	2,018	2,018

* p<0.05; ** p<0.01

Table 2b: Results of Panel Regression (Change Ln REER on change Ln commodity price indices, resource exports/GDP, and interaction term using 92 Countries from 1975-2011, fixed effects)

	Change ln REER
Change Ln Agricultural Raw Material Price Index	-0.113
	(3.41)**
Change Ln Food/Beverage Price Index	0.124
	(4.09)**
Change Ln Energy Price Index	0.060
	(4.20)**
Change Ln Metal Price Index	-0.031
	(1.67)
Agricultural Raw Material Exports/GDP	0.020
	(0.11)
Food/Beverage Exports/GDP	-0.071
	(0.97)
Energy Exports/GDP	0.025
	(0.57)
Metal Exports/GDP	0.106
	(1.06)
Agricultural Raw Material Exports-Price Interaction	-0.149
	(0.13)
Food/Beverage Exports-Price Interaction	0.017
	(0.05)
Energy Exports-Price Interaction	-0.024
	(0.21)
Metal Exports-Price Interaction	0.501
	(1.87)
Constant term	-0.002
	(0.37)
R^2	0.03
N	2,018

* p<0.05; ** p<0.01

Works Cited

Beine, M., Bos, C. S., & Coulombe, S. (2012). Does the Canadian economy suffer from Dutch disease?. *Resource and Energy Economics*, *34*(4), 468-492.

Cashin, P., Céspedes, L. F., & Sahay, R. (2004). Commodity currencies and the real exchange rate. *Journal of Development Economics*, *75*(1), 239-268.

Corden, W. M. (1984). Booming sector and Dutch disease economics: survey and consolidation. *oxford economic Papers*, *36*(3), 359-380.

Corden, W. M. (2012). Dutch Disease in Australia: Policy Options for a Three-Speed Economy. *Australian Economic Review*, *45*(3), 290-304.

Corden, W. M., & Neary, J. P. (1982). Booming sector and de-industrialisation in a small open economy. The economic journal, 92(368), 825-848

Harding, T., & Venables, A. J. (2010). Foreign exchange windfalls, imports and exports. *Unpublished. University of Oxford*.

Javaid, S. H. (2011). Dutch disease investigated: empirical evidence from selected South-East Asian economies. *Journal of Economic Cooperation and Development*, *32*(4), 51-74.

Krugman, P. (1987). The narrow moving band, the Dutch disease, and the competitive consequences of Mrs. Thatcher: Notes on trade in the presence of dynamic scale economies. *Journal of development Economics*, *27*(1), 41-55.

Lartey, E. K. (2008). Capital Inflows, Resource Reallocation and the Real Exchange Rate*. *International Finance*, *11*(2), 131-152.

Lartey, E. K. (2011). Financial Openness and the Dutch Disease. *Review of Development Economics*, *15*(3), 556-568.

Lartey, E., Mandelman, F., & Acosta, P. (2008). Remittances, exchange rate regimes, and the Dutch disease: a panel data analysis.

Mohammadi, H., & Jahan-Parvar, M. R. (2012). Oil prices and exchange rates in oil-exporting countries: evidence from TAR and M-TAR models. *Journal of Economics and Finance*, *36*(3), 766-779.

Ruehle, A. A., & Kulkarni, K. G. (2011). Dutch disease and the Chilean copper boom–an empirical analysis. *International Journal of Education Economics and Development*, *2*(1), 61-80.

Sachs, J. D., & Warner, A. M. (2001). The curse of natural resources. *European economic review*, *45*(4), 827-838.

Sosa, S., & Magud, N. E. (2010). *When and Why Worry About Real Exchange Rate Appreciation? The Missing Link between Dutch Disease and Growth (EPub)*. International Monetary Fund.

Taiebnia, A., & Shakeri, G. (2012). The Impact of Oil Price Rise on Industrial Production. *Iranian Economic Review*, *17*(1), 13-31.

The Dutch disease. (1977, November 26). *The Economist*. Retrieved from The Economist Historical Archive

Van der Ploeg, F. (2011). Fiscal policy and Dutch disease. *International Economics and Economic Policy*, *8*(2), 121-138.

World Bank. (2013). *World Development Indicators*, *1975-2011* [Data set]. Retrieved from http://data.worldbank.org/data-catalog/world-development-indicators